Problem Set 2-4

Reading Analysis

From what you have read in this section, what do you consider to be the main idea? Explain the statement "A logarithm is an exponent" and support it with examples.

Quick Review

Q1. In the expression 7^5, the number 7 is called the __?__.

Q2. In the expression 7^5, the number 5 is called the __?__.

Q3. The entire expression 7^5 is called a(n) __?__.

Q4. Write $x^5 \cdot x^7$ as a single exponential expression.

Q5. Write $\frac{x^5}{x^7}$ as a single exponential expression.

Q6. Write the expression $(x^5)^7$ without parentheses.

Q7. For the expression $(xy)^7$, you __?__ the exponent 7 to get x^7y^7.

Q8. Explain the meaning of 5^{-2}.

Q9. Explain the meaning of $9^{1/2}$.

Q10. The function $y = 5^x$ is called a(n)

A. Power function

B. Exponential function

C. Polynomial function

D. Linear function

E. Inverse of a power function

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1. What does it mean to say that $-0.1549\ldots$ equals log 0.7?

2. What does it mean to say that $0.9030\ldots$ equals log 8?

3. By the definition of logarithm, if $a = \log b$, then $10^{\text{?}} = \text{?}$.

4. By the definition of logarithm, if $10^a = b$, then __?__ = log __?__.

For Problems 5–8, use the definition of logarithm to write the value of x. Then confirm that your solution is correct by raising 10 to the given power, taking the logarithm of the result, and showing that the final result agrees with your answer.

5. $\log 10^{1.574} = x$

6. $\log 10^{2.803} = x$

7. $\log 10^{-0.981} = x$

8. $\log 10^{23.58} = x$

For Problems 9–12, use the definition of logarithm to write x as a logarithm. Then evaluate the logarithm by calculator and show that raising 10 to that power gives a result that agrees with the given equality.

9. $57 = 10^x$

10. $359 = 10^x$

11. $0.85 = 10^x$

12. $0.0321 = 10^x$

For Problems 13–16, find the logarithm by calculator. Then show numerically that raising 10 to that power, gives the argument of the logarithm.

13. log 1066

14. log 2001

15. log 0.0596

16. log 0.314

For Problems 17–20, evaluate the power of 10. Then show that the logarithm of the answer is equal to the original exponent of 10.

17. $10^{-2.7}$

18. $10^{3.5}$

19. $10^{15.2}$

20. 10^{-4}

21. Find log 5, log 4, and log 20. Show that log 20 = log 5 + log 4. What property of logarithms does this equality illustrate? What property of exponentiation does this property come from?

22. Find log 30, log 4, and log 120. Show that log 120 = log 30 + log 4. What property of logarithms does this equality illustrate? What property of exponentiation does this property come from?

23. Find log 35, log 7, and log 5. Show that log 5 = log 35 − log 7. What property of logarithms does this equality illustrate? What property of exponentiation does this property come from?